

## Claims

- [c1] What is claimed is:
1. A location system for determining the location of a tagged item in a facility, the location system comprising:  
a plurality of room transmitters capable of being located throughout the facility, each room transmitter having a unique, modulated signature;  
at least one item tag operable to be associated with an item and having an identity, a receiver operable to receive the signatures of the room transmitters, and a transmitter to send a signal having information related to the signature of a room transmitter within the reception range of the item tag and information related to the identity of the item tag; and  
at least one locating receiver tuned to receive the signal of the at least one item tag and to determine the identity of the item tag and the likely location of the item tag within the facility.
  - [c2] 2. A system as claimed in claim 1, further comprising a control computer coupled to the at least one locating receiver and operable to generate an output indicative of the location of the at least one item tag.
  - [c3] 3. A system as claimed in claim 1, further comprising at least two item tags.
  - [c4] 4. A system as claimed in claim 1, further comprising at least two locating receivers.
  - [c5] 5. A system as claimed in claim 1, wherein each of the plurality of room transmitters includes a power supply, a control circuit, a tone generator, and a transducer.
  - [c6] 6. A system as claimed in claim 5, wherein the at least one item tag includes a transducer, an identification module, a power supply, and a control circuit coupled to the transmitter.
  - [c7] 7. A system as claimed in claim 1, wherein each of the plurality of room transmitters includes a power supply, a control circuit, a pulse generator, and an infrared device.

- [c8] 8. A system as claimed in claim 7, wherein the at least one item tag includes an infrared sensor, an identification module, a power supply, and a control circuit coupled to the transmitter.
- [c9] 9. A system as claimed in claim 1, wherein the locating receiver includes a signal receiver, an identity decoder, and a signature analyzer, the identity decoder and signature analyzer each coupled to the signal receiver.
- [c10] 10. A system as claimed in claim 1, wherein one or more of the plurality of room transmitters includes a housing with a grill and electrical connectors configured to fit in an electrical outlet.
- [c11] 11. A system as claimed in claim 1, wherein one or more of the plurality of room transmitters includes a face plate with a grill and is designed to fit within the recess of an electrical outlet.
- [c12] 12. A system as claimed in claim 1, wherein one or more of the plurality of room transmitters includes a housing with a window and electrical connectors configured to fit in an electrical outlet.
- [c13] 13. A system as claimed in claim 1, wherein one or more of the plurality of room transmitters includes a face plate with a window and is designed to fit within the recess of an electrical outlet.
- [c14] 14. A system as claimed in claim 1, wherein each of the plurality of room transmitters includes a PLC circuit.
- [c15] 15. A system as claimed in claim 1, wherein two or more of the plurality of room transmitters include a secondary receiver.
- [c16] 16. A system as claimed in claim 15, wherein each secondary receiver is an RF receiver.
- [c17] 17. A system as claimed in claim 15, wherein each secondary receiver is an ultrasonic receiver.
- [c18] 18. A location system for determining the location of a tagged item in a facility,

the location system comprising:

a plurality of room transmitters capable of being located throughout the facility, each room transmitter having a power supply, a control circuit, a transmitter driver, and a transmitter, the control circuit and transmitter driver operable to generate a unique, modulated signature for each room transmitter;

at least one item tag operable to be associated with an item and having an identification module, a receiver operable to receive the signatures of the room transmitters, a power supply, a transmitter to send a signal having information related to the signature of a room transmitter within the reception range of the item tag and information related to the identity of the item tag, and a control circuit coupled to the transmitter; and

at least one locating receiver operable to receive the signal of the at least one item tag, the at least one locating receiver having an identity decoder, and a signature analyzer, the at least one locating receiver operable to determine the identity of the item tag and the likely location of the item tag within the facility.

[c19]

19. A system as claimed in claim 18, wherein one or more of the plurality of room transmitters includes a housing with a grill and electrical connectors configured to fit in an electrical outlet.

[c20]

20. A system as claimed in claim 18, wherein one or more of the plurality of room transmitters includes a face plate with a grill and is designed to fit within the recess of an electrical outlet.

[c21]

21. A system as claimed in claim 18, wherein one or more of the plurality of room transmitters includes a housing with a window and electrical connectors configured to fit in an electrical outlet.

[c22]

22. A system as claimed in claim 18, wherein one or more of the plurality of room transmitters includes a face plate with a window and is designed to fit within the recess of an electrical outlet.

[c23]

23. A system as claimed in claim 18, wherein each of the plurality of room transmitters includes a PLC circuit.

- [c24] 24. A system as claimed in claim 18, wherein two or more of the plurality of room transmitters includes a secondary receiver.
- [c25] 25. A system as claimed in claim 24, wherein each secondary receiver is an RF receiver.
- [c26] 26. A system as claimed in claim 24, wherein each secondary receiver is an ultrasonic receiver.
- [c27] 27. A method of locating an item in a facility, the method comprising:  
positioning a number of room transmitters in multiple areas within a facility;  
configuring each room transmitter to generate a unique, modulated signature;  
fitting one or more items with a location tag;  
configuring each location tag to generate a signal having information regarding the identity of the location tag and the signature of any room transmitter within a reception range of the respective tag;  
positioning at least one locating receiver within the facility; and  
determining the likely location and identity of the location tag based on the signal of the location tag.
- [c28] 28. A method as claimed in claim 27, further comprising coupling a control computer to the at least one locating receiver and generating an output indicative of the location and identity of the location tag.
- [c29] 29. A method as claimed in claim 27, further comprising synchronizing the room transmitters within a room so that each room transmitter sends a unique, time dependent signal.
- [c30] 30. A method as claimed in claim 29, further comprising configuring a first room transmitter to send a time varying signal that varies between a first frequency and a second frequency and configuring a second room transmitter to send a time varying signal that varies between a third frequency and a fourth frequency during the same time that the first transmitter sends its time varying signal.

- [c31] 31. A method as claimed in claim 30, further comprising determining the location of a location tag based on the offset of the time varying signals from the first and second room transmitters.
- [c32] 32. A method as claimed in claim 27, further comprising configuring each room transmitter with a secondary receiver.
- [c33] 33. A method as claimed in claim 32, further comprising sending a signal from at least one locating receiver to each room transmitter.
- [c34] 34. A method as claimed in claim 33, further comprising sending a synchronization code to each room transmitter that causes each room transmitter to transmit its respective signature signal at a known time; and determining the location of a location tag based on the time that the location tag receives signature signals from the room transmitters.
- [c35] 35. A method as claimed in claim 27, further comprising configuring each room transmitter with a PLC circuit.
- [c36] 36. A method as claimed in claim 27, further comprising positioning a reference tag in a location within the facility.
- [c37] 37. A method as claimed in claim 36, further comprising configuring the reference tag to transmit a reference signal on a periodic basis.
- [c38] 38. A method as claimed in claim 27, further comprising configuring each room transmitter to listen for signals from other room transmitters.
- [c39] 39. A method of locating an item in a facility, the method comprising:  
 positioning a number of room transmitters in multiple areas within a facility;  
 configuring each room transmitter to generate a unique, modulated signature;  
 fitting one or more items with a location tag;  
 distributing the tagged items throughout the facility;  
 configuring each location tag to have an identity, to transmit its identity, and to retransmit the signature or a representation of the signature of any room transmitter within a reception range of the respective tag;

positioning at least one locating receiver within the facility; and  
determining the likely location and identity of at least one of the location tags  
based on transmissions from that location tag received by the locating receiver.

[c40] 40. A method as claimed in claim 39, further comprising generating an output  
indicative of the location and identity of the location tag.

[c41] 41. A method as claimed in claim 39, further comprising synchronizing the  
room transmitters within an area within the facility so that each room  
transmitter sends a unique, time dependent signal.

[c42] 42. A method as claimed in claim 39, further comprising configuring a first  
room transmitter to send a time varying signal that varies between a first  
frequency and a second frequency and configuring a second room transmitter  
to send a time varying signal that varies between a third frequency and a fourth  
frequency during the same time that the first transmitter sends its time varying  
signal.

[c43] 43. A method as claimed in claim 42, further comprising determining the  
location of a location tag based on the offset of the time varying signal from the  
first and second room transmitters.

[c44] 44. A method as claimed in claim 39, further comprising configuring each room  
transmitter with a secondary receiver.

[c45] 45. A method as claimed in claim 44, further comprising sending a signal from  
at least one locating receiver to each room transmitter.

[c46] 46. A method as claimed in claim 45, further comprising  
sending a synchronization code to each room transmitter that causes each room  
transmitter to transmit its respective signature signal at a known time; and  
determining the location of a location tag based on the time that the location  
tag receives the signature signals from the room transmitters.

[c47] 47. A method as claimed in claim 39, further comprising configuring each room  
transmitter with a PLC circuit.

[c48] 48. A method as claimed in claim 39, further comprising positioning a reference tag in a location within the facility.

[c49] 49. A method as claimed in claim 48, further comprising configuring the reference tag to transmit a reference signal on a periodic basis.

[c50] 50. A method as claimed in claim 49, further comprising configuring each room transmitter to listen for signals from other room transmitters.

[c51] 51. A location system for determining the location of an item in a facility, the location system comprising:  
a plurality of room transmitters capable of being located throughout the facility, each room transmitter having a unique, modulated signature;  
at least one tag operable to be associated with an item and having an identity, a receiver operable to receive the signatures of the room transmitters, and a transmitter to send a signal having information related to the signature of a room transmitter within the reception range of the tag and information related to the identity of the tag; and  
at least one locating receiver operable to receive the signal of the at least one tag and to determine the identity of the tag and the likely location of the tag within the facility.

[c52] 52. A system as claimed in claim 51, wherein the at least one tag is incorporated in a telemetry device.

[c53] 53. A system as claimed in claim 52, wherein the telemetry device includes  
at least one signal conditioner to condition a telemetry input;  
a filter and mixer coupled to the receiver of the tag;  
a multi-channel combiner coupled to the transmitter of the tag; and  
a switch coupled between the at least signal conditioner, filter and mixer, and the multi-channel combiner.